

ECOTOX User Guide

ECOTOXicology Database System

Version 3.0

Prepared for

U.S. Environmental Protection Agency
Office of Research and Development
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Contract 68-W-01-032, Task 24

December, 2002

WARNING

Researchers and managers using ECOTOX for analyses or summary projects should consult the original publication. This will ensure an understanding of the context of the data retrieved from ECOTOX.

ECOTOX attempts to be comprehensive, but due to funding gaps, data from recent publication years may not appear in the database. Researchers should conduct literature searches for additional relevant data to supplement ECOTOX retrievals for terrestrial data.

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INTRODUCTION

In the development and implementation of ecosystem management decisions there is the need to establish scientifically credible risk assessments for chemical stressors. Ecological assessments are required to characterize and diagnose the relative risk of chemical pollutants and to predict future risk as a function of environmental management options.

ECOTOX (ECOTOXicology Database System) is a comprehensive computer-based system that provides single chemical toxic effect data for aquatic life, terrestrial plants, and terrestrial wildlife. This data is useful in developing consistent ecosystem management decisions within EPA and other Federal, state, local, tribal and international governmental agencies. ECOTOX provides a means to cost-effectively collect standardized and critically needed effects data for a wide variety of ecological risk assessments.

ECOTOX, developed at the U.S. EPA MED-Duluth, integrates three previously independent databases - AQUIRE, PHYTOTOX, and TERRETOX - into a unique system which includes toxicity data derived predominantly from the peer-reviewed literature, for aquatic life, terrestrial plants, and terrestrial wildlife, respectively. The U.S. EPA Office of Pesticide Program's Ecotoxicity Pesticide Database (formerly Environmental Effects Database) toxic effects data for registered pesticides is also included within ECOTOX. Not all data published in the peer review ecotoxicology literature are included in ECOTOX. You should refer to the Limitations section of this document to understand test results that are not considered for inclusion in the database.

AQUIRE, the aquatic toxicology database was developed in 1981. The aquatic toxicity data compilation spans the publication years from 1915 through to the present time. Retrieval, review, and encoding of terrestrial plant toxicology literature into PHYTOTOX began in 1981. Data are available from the publication year 1926 through to the present time. Terrestrial animal toxicology literature has been retrieved, reviewed and entered into TERRETOX since 1983. Data are available from the publications year 1969 to the present time.

The Ecotoxicity Pesticide Database (formerly Ecological Effects Database), U.S. EPA Office of Pesticide Programs, is integrated into ECOTOX via periodic updates from the Office of Pesticide Programs. The Ecotoxicity Pesticide Database includes toxicity data for aquatic and terrestrial life. These data have been reviewed and categorized as acceptable for fulfillment of pesticide registration and re-registration guideline requirements as explained under FIFRA Subdivision E, Parts 158.145 and 158.150.

Researchers or managers using ECOTOX for analyses or summary projects should consult the original scientific paper to ensure an understanding of the context of the data retrieved from ECOTOX.

For more information on the ECOTOX database contact:

ECOTOX Support
U.S. Environmental Protection Agency
Office of Research and Development
National Health and Environmental Effects Research Laboratory
Mid-Continent Ecology Division (MED-Duluth)
6201 Congdon Boulevard
Duluth, Minnesota 55804
Telephone: 218-529-5225
Fax: 218-529-5003
E-mail: ecotox.support@epa.gov

GETTING STARTED

Access

To access the ECOTOX Web site, you will need a computer equipped with a World Wide Web browser and a means of connecting to the Internet. Start your browser and type in the Internet address <http://www.epa.gov/ecotox/> and you will be connected to the ECOTOX home page. The home page provides a general overview of the ECOTOX database with links to About ECOTOX/ Help, Quick Database Query, Advanced Database Query, Frequently Asked Questions and Data Download. From the home page, you may select one of two ways to search ECOTOX. The Quick Query form allows a simple search for a limited number of chemicals, species, effects and publication years. The Advanced Query is menu driven and uses navigation links to direct you through multiple search criteria pages. The Advanced Query utilizes all search and output features.

To conduct a search, click on either the "Quick Database Query " or "Advanced Database Query" option. The search page will then load.

ECOTOX LIMITATIONS

Users should review the limitations of ECOTOX data retrieval and system requirements prior to performing searches this site.

Data Limitations

The following restrictions are placed on published data. Data not satisfying these requirements are excluded from the ECOTOX databases:

- The author(s) must report valid species and chemical information. If the ECOTOX staff cannot verify the species Scientific and common names or locate the chemical's Chemical Abstract Services (CAS) Registry number, the data record is not included in the database.
- Only single chemical exposures are included in ECOTOX, therefore results for chemical mixtures are excluded.
- The author(s) must identify the exposure duration associated with the observed effect.
- Bacteria and virus studies are not included.

- The author(s) must report either a chemical concentration or application rate and the associated observed effect.
- *In vitro* exposures are not included in the ECOTOX database.
- Toxicity test data for chemical exposures where only sediment concentrations are reported are excluded from the aquatic database.
- In general, tests conducted with petroleum (fuel oils) and air pollution (CO₂ and ozone) chemicals are excluded from ECOTOX.

Version 3.0 Limitations

The following limitations exist when using ECOTOX:

- The query pages require that your browser support JavaScript and this feature must be activated in your browser preferences.
- ECOTOX does not function properly when using Windows 3.1.
- ECOTOX supports these browser versions:
 - Netscape Navigator 4.x, 7.x
 - Explorer 4.x and higher.
- The following browser versions are not supported:
 - Queries do not function properly using Netscape 6.x.
- There is a maximum number of 500 terrestrial and/or 5000 aquatic records that can be retrieved in one browser viewable search. The delimited export file will retrieve up to 10,000 terrestrial or aquatic records.


ONLINE HELP

Our online overview describes the ECOTOX web site contents and navigational resources available for you.

The U.S. EPA's ECOTOXicology database (ECOTOX) is a source for locating single chemical toxicity data for aquatic life, terrestrial plants and wildlife. ECOTOX was created and is maintained by the Office of Research and Development's (ORD's), National Health and Environmental Effects Research Laboratory (NHEERL) / Mid-Continent Ecology Division.

Database searches can be conducted using either a Quick Query or an Advanced Query menu. The Quick Query supports searches on habitat, taxonomic kingdom, species common or Scientific name, Chemical Abstract Service Registry number or chemical name, observed effect group and publication year. The Advanced Query menu includes all options under Quick Query, and enables you to focus on more specific criteria such as study site type (e.g., laboratory, field), exposure media (e.g., freshwater, soil), route of chemical exposure (e.g., oral, diet), and statistically-derived endpoints (e.g., LD50, NOEL). Search results can be downloaded either as an ASCII delimited file format, which can be transferred into a database or spreadsheet, or in a browser viewable report format.

The blue side bar menu will assist you in navigating ECOTOX queries and help.

When you are within the Quick or Advanced Query pages and you click on a  for additional help within your search, a separate help window will display with the information requested. You may navigate within the help window without affecting your search session.

Printable help is available in PDF (Portable Document Format) for three larger documents, How to Search, Data Field Descriptions and Code List. To ensure you will be able to see a PDF file in its entirety, please obtain the most recent edition of the free Acrobat Reader from Adobe (www.adobe.com).

The help resources available to assist you are:

Help Manuals <ul style="list-style-type: none">How to Search (PDF)Data Field Descriptions (PDF)Code List (PDF) Browse ECOTOX Files <ul style="list-style-type: none">Chemical IndexSpecies IndexEffect Measurement Index	Additional Help <ul style="list-style-type: none">Frequently Asked QuestionsGlossaryLimitationsSearch PlannerUseful Web Links ECOTOX Coding Guidelines <ul style="list-style-type: none">Aquatic Coding Guidelines (PDF only)Terrestrial Coding Guidelines (PDF only)ECOTOX Code Appendix (PDF only)
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A brief description of each help file is presented below:

How to Search - Find information on search strategies, how to navigate through a search and produce output reports.

Search Planner - A form listing all ECOTOX search options to assist you in planning your search strategy.

Data Field Descriptions - Locate definitions of the data fields found in ECOTOX.

Code List - Lists and defines all codes used in the ECOTOX data fields and reports.

Chemical Index - Locate ECOTOX chemicals available for searching. You can search by Chemical Abstracts Registry number or by chemical name. ECOTOX does not support chemical synonym searching.

Species Index - Locate ECOTOX species available for searches. You can search by common name, Scientific Name or ECOTOX species number.

Effect Measurement Index - Find effect measurement codes and definitions.

Frequently Asked Questions - Many questions can be answered by consulting commonly asked questions.

Glossary - Definitions of commonly used acronyms and terms.

Search Planner - Concise list of all search and output features to assist you in organizing your search strategy

Useful Web Sites - Helpful web sites related to toxicology.

Aquatic Coding Guidelines - The document contains detailed instructions on how each aquatic data field is encoded. Also includes staff training and quality assurance procedures for review process.

Terrestrial Coding Guidelines - This document contains detailed instructions on how each terrestrial data field is encoded.

ECOTOX Code Appendix - Lists all codes referred to in the aquatic and terrestrial coding guidelines.

Comments - If you have a question that can't be answered through this help system, please contact us with your question. A comment link is located at the top and bottom of every page within ECOTOX.

DATABASE QUERY

Quick Database Query Navigation

The Quick Database Query supports searches on habitat, taxonomic kingdom, five species common or Scientific names, five Chemical Abstract Service Registry numbers or chemical names, observed effect group and publication year.

To navigate within the Quick Query page, you can use your browser scroll bar to move up or down, or use the light blue menu located in the upper right hand of the search page by clicking on the hyperlink.

To narrow your search, use one or more of the following options: [Kingdom](#) or [Habitat](#) or [Chemical](#) or [Species](#) or [Effects](#) or [Publication Years](#) or [Report Format](#)

You must select an input category from the “Choose Category” box located to the right of each chemical and species entry. You may clear the search and perform the search by clicking on the appropriate button at the top or bottom of the search form.

The Browse Chemical Index and Browse Species Index links allow you to review our chemical and species, index files prior to searching. These browse features help you locate the best input format to enter in the query fields.

If your search requirements are more extensive, please use our Advanced Database Query. If you want information on how to use this system, please refer to our About ECOTOX/ Help.

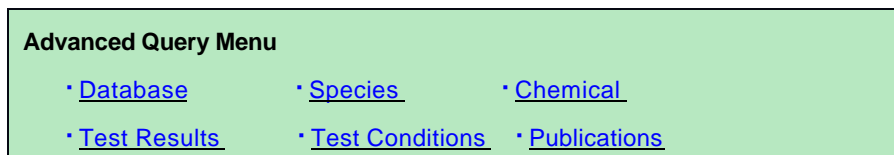
The default report format is a browser viewable report (See Appendices D and E), which is presented on multiple pages. Under the “report” section of the Quick Query page, you can change the report format to either a single browser viewable report (i.e., all data appear on one page) or a delimited file format for use in transferring search results to PC-based spreadsheets. You should be aware that for large reports the selection of a single browser viewable report format may cause instability of your browser or computer.

For information on conducting effective searches using the Quick Query feature, go to the “How to Search” section of the “About ECOTOX/Help” page. Within the “How to Search”, you will find search strategies for specifying a database, chemical searches, species searches, effects and publication year searches. Some search strategies may only be used in the Advanced Query pages.

Advanced Database Query Navigation

General Navigation and Menus

The Advanced Query form is designed to lead you through a search session using multiple forms. Each page provides a menu and navigational graphics that will take you to various locations within the ECOTOX Advanced Query pages. Within each search page, the query menu options available are:



Search options within each search parameter include:

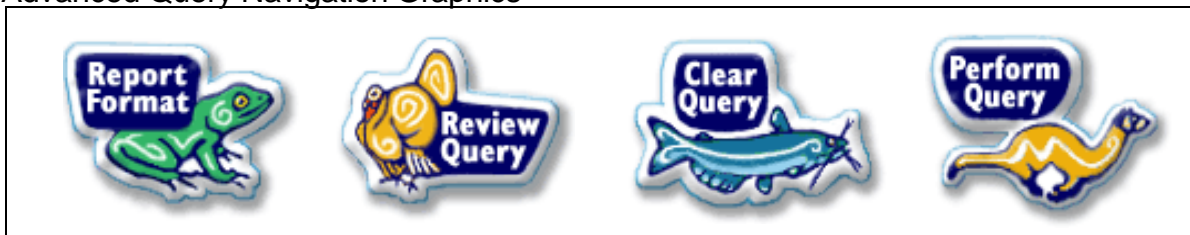
- **Database** (Kingdom, Habitat Type, Independently Compiled Datasets and Recent Modifications/Additions)
- **Species** (Species)
- **Chemical** (Chemical Entry, Predefined Chemical Lists)
- **Test Results** (Endpoints, Effects and Measurements, Documentation Codes)
- **Test Conditions** (Test Location, Exposure Media, Exposure Type, Method of Chemical Analysis)
- **Publications** (Reference Number, Publication Year)

You can navigate within each Advanced Query page by either using your browser scroll bar to move up or down within the page, or using the hyperlinks in the light blue menu located each at the top of each search page. Example blue target menu:

To narrow your search, use one or more of the following options: [Kingdom](#) or [Habitat](#) or [Independently Compiled Data](#) or [Recent Modifications/Additions](#)

To modify your report format, review your query selections, clear your query and perform your query, use the navigation graphics located at the top of every page.

Advanced Query Navigation Graphics



- ! **Report Format** - View and modify the report options for field display, order and output format.
- ! **Review Query** - View your search criteria
- ! **Clear Query** - Erases all previously selected search criteria
- ! **Perform Query** - Activates your search and will display report results in a separate window

You may need to move within an ECOTOX screen by using the scroll bars at the right and bottom of the monitor. The right scroll bar moves up and down, the bottom moves left and right. There are also buttons located strategically throughout the page that will take you back to the top menu.

**Advanced Query Selection Boxes**

Creating a search in the ECOTOX database requires that you enter information about the chemicals and/or species that you are interested in as well as selecting other criteria (e.g., endpoints, effects, publication year etc.) from predefined lists. The majority of these selection boxes consist of two lists side-by-side, one containing items not selected and the other containing those items that have been selected. Positioned between the lists are two fishes, one pointing to the left and the other to the right. To add an item to the list of selected items, click on an item in the box on the left, and then click on the fish that points to the right to transfer the item to the selected items list located on the right. After you have clicked on the fish, you should see the item appear in the selected items list. Note that if the selected list already has many items in it, you may have to use the scroll bar on the list to scroll down and see your selection. Removing items from the selected items list and returning them to the unselected items list is exactly the same procedure only you select the item that you want to remove and use the left fish to move it back to the unselected items list.

Multiple Selection

In the case of very long lists such as publication year, you may wish to select multiple items from one list and move them to the other list. This can be accomplished in two different ways. The first method is useful when you wish to select multiple items from the list that are

not necessarily contiguous in the list. For example, if you wish to search on publication years 1998, 1996 and 1970, you can hold the control key (ctrl) down on your keyboard while you click on each item. Each item that you click on, while the control key is held, will be highlighted and can be transferred to the other list using the appropriate fish button. The second method is useful when you wish to select a series of contiguous items in a list such as a range of publication years. For example, if you wish to search on all data from documents published between 1994 and 1998, you first select 1994 with your mouse and then select 1998 while holding the shift key down. You will see that all years 1994-1998 are now selected and you can move them to the opposite list using the appropriate fish button.

Moving Up/Moving Down within Selection Boxes

Some of the selection boxes that contain order dependent information, such as Output Selections, may have two additional buttons on the right side marked *Move Up* and *Move Down*. These buttons can be used to change the order of the selected items list.

For example, if you wish to make a field under the Using Output Selections screen appear in a different position/column of your report, you should highlight the item in the list using your mouse and then click either the *Move up* or *Move Down* button. You will see that it moves within the list, yet the order of all other entries is preserved. This feature is very useful when you wish to customize your output or sort orders. Note that multiple selection using the control and shift keys does not apply to this feature, only one item may be moved at a time.

CONDUCTING A SEARCH

Search Strategy

The search forms are designed to search on all data, unless you restrict the search by adding search criteria (e.g., entering a check in boxes, enter text in an input field). You may perform the search at any time after you have specified your search criteria. You do not have to enter something in every search criteria area.

The search strategy for ECOTOX includes two basic elements: combination/union and intersection. Within a search category (e.g., species), the search will combine all your search selections. Between each search field the search will intersect your selections (e.g., intersection between chemical and species selections). You may also want to use the ECOTOX Search Planner located in Appendix A to plan your searches. Appendix B describes some sample searches to assist you in using the ECOTOX software.

Each query performed is divided into several search screens: e.g., Database (Kingdom, Habitat Type, Independently Compiled Datasets and Recent Modifications/Additions), Species, Chemical (Chemical Entry, Predefined Chemical Lists), Test Results (Endpoints,

Effects and Measurements, Documentation Codes), Test Conditions (Test Location, Exposure Media, Exposure Type, Method of Chemical Analysis), and Publications (Reference Number, Publication Year). These search screens are linked together using the Advanced Database Query menu available at the top of each search page. Each search screen and each search element are combined into a set that includes all the data records that contain information on the search parameters for that search element. For example, if you select the species *fathead minnow* and *Daphnia magna*, the species result set will be the combination of the record numbers that contain information on either species. If you also select the Mortality Group Effect and Population Group Effect, the results of those two searches would be combined into a single set of record numbers. If you have made search selections in multiple search screens (e.g., species and effect) and then select "Perform Query", ECOTOX will present the records that meet the criteria for all search screen selections (e.g., records that include any of the selected species AND any of the selected effects).

Advanced Database Query

The Advanced Database Query option provides a broader range of search parameters than available in the Quick Database Query window. The default is that all data will be searched. As you define your search criteria, the number of records that can be retrieved from the ECOTOX database will be reduced.

Kingdom

Species kingdom level searching is available on both the Quick and Advanced database query. The plant kingdom search also includes species representing Monera and Fungi. Some test results report both plant and animal species as one effect measurement (e.g., aquatic community, plankton, soil community). These results will be included when plant, animal or both kingdoms are selected.

To eliminate a currently selected habitat or kingdom or to select a database that is not currently active, click the appropriate check box and the status of the selected database will change.

Habitat Type

The ECOTOX database includes effects records for terrestrial and aquatic species. Using the Habitat Type feature, you may limit your search to one species habitat. The default is that both habitat types are selected.

Independently Compiled Data

ECOTOX includes several independently compiled data sets. Data sets from the Organization for Economic Cooperation and Development (OECD), Russia, Office of Pesticide Programs, the U.S. Geological Survey, and MED-Duluth are included as subsets

of the ECOTOX database. For further information on these data files, refer to the Appendix C. The ECOTOX default is that all data sets are included in your search result. You may override the default and include up to six specific data sets in your search criteria. To search on one or more independently compiled data sets, use your mouse button to select one or more of the data sets.

Recent Modifications and Additions

You may search for data records by the update or modification date. The default is that all data, regardless of the date they were added to ECOTOX, are included in your search result. You may select from any update made since ECOTOX was placed on the Internet. To make a choice, click the appropriate checkbox. Clicking on another checkbox deselects the previous selection.

Chemical Searching

Using the Chemical search screen, you can conduct queries on CAS Registry numbers, partial or complete chemical names, and pre-built lists of chemicals. The default is that all chemicals are selected for searching. By using the Browse Chemical feature, you can identify what chemical names will be identified using a chemical string search. You can also verify whether your chemical is in the ECOTOX database. See below for further information on the use of the Browse Chemical feature. ECOTOX does not include a chemical synonym file. Many times the chemical name entered by a user is not located in the ECOTOX database even though the chemical is actually in the database. This is because the chemical name stored in the ECOTOX database is the Collective Indices name. You typically have only the common or trade name of a substance. Therefore we recommend that you conduct searches using either the CAS Registry number or predefined lists of chemicals.

To conduct a chemical search you must enter either a chemical name (partial or complete) or CAS Registry number in the empty fields provided (boxes on the left). You must then move to the box on the right and select the type of data you have entered (Chemical Name, Chemical Name (exact) or CAS Number).

If you want to conduct a search on more than five chemicals, you must use the Advanced Database Query. Within the chemical search screen, click on the "Add more entries" button (blue box located below the five data entry boxes). This will take you to a page where you can enter as many chemicals as is necessary. You may cut and paste lists of chemicals into this box, but ensure that only one chemical is entered on each line. See below for further information on the use of the Advanced Chemical Entry.

To conduct a search on a particular chemical you must identify the compound one of three ways:

CAS Registry Number - Enter the CAS Registry numbers you wish to search on, placing each number in a separate field in the CAS Registry numbers section. You may enter the CAS Registry number with or without hyphens and leading zeros.

Chemical Name - Enter the names of the chemicals you wish to search on, placing each name in a separate field. After entering the chemical name identify whether you wish to search on the exact name (Chemical Name (exact)) or searching on a substring (Chemical Name). If Chemical Name is selected from the Choose Category list, any chemical names including the text string(s) entered will be included in your search results. For the most part, ECOTOX uses the Collective Index name for chemical searching and does not currently have a synonym file. If you want to restrict the search to only search on a specific term, you may choose the exact match category. For example, if you enter the term *benzene* selecting the exact match category, you will only search for the specific chemical benzene, not all the benzene derivatives. It is recommended that you search on CAS Registry numbers, if you are unsure of the Collective Index name.

Using the Browse Chemicals

By clicking on the 'Browse Chemical' hotlink located directly above the chemical search box, a new browser window will open and you will have access to the ECOTOX chemical information index file. This index will assist you in planning your chemical search strategy by allowing you to enter different chemical names or name sub-strings to determine whether or not your chemical name is in the ECOTOX database and what other chemicals will be included if your sub-string is used. The Browse Chemical search result provides a list of the CAS Registry number(s) and all instances where your text string was included in a chemical name in the ECOTOX index file. For example, if you were to enter 'xylene' as a chemical string within ECOTOX, the following chemicals would be included in your search result:

81152	Trinitro-t-butyl xylene
89587	Nitro-p-xylene
881992	alpha,alpha'-Hexachloro—xylene
1074244	2,5-Dibromoxylene
1330207	Xylene
13209159	a,a',a'-Tetrabromo-O-xylene

You can then either use the resulting chemical names in your search or conduct your search using the CAS Registry numbers that are displayed using the Browse Chemicals index. Remember that you can cut and paste from the chemical index screen into the ECOTOX search screen.

Advanced Chemical Query

The Advanced Chemical Query allows you to enter more than five chemical search criteria in one query. In fact, these search screens allow you to search for any number of entries

[Note: Netscape 4.7x has a limitation of 3709 entries]. All entries must be of the same category (Chemical Name or CAS Registry Number) and each chemical must be placed on a separate line. Please end your selections with a final return (enter) to make sure your final entry is included correctly. An example has been provided on the correct method of entering the data. The data retrieved will use any part of the words given in the textbox (e.g., a search on the CAS Registry number 50000 will return both 50000 and 13150000).

Advanced Chemical Query

" Chemical Name	! CAS Number
99865	
99876	
99898	
99934	
100005	
100016	
100027	

If you are storing your chemical records in another source (like a spreadsheet), you may cut and paste the values into this box just like any other Windows application. For example, taking the information from an Excel spreadsheet you would:

1. Highlighting all the items in the spreadsheet (please keep it to one column).
2. Press CTRL+C (or select Copy under the Edit Menu).
3. Bring up the Advanced Query page.
4. Click in the Text Box (so the cursor is blinking in the box).
5. Press CTRL+V (or select Paste under the Edit Menu).

Select from Predefined Chemical Lists

The option to select from predefined lists is only available in the Advanced Database Query. Chemical lists have been provided to effectively search chemicals important to the U.S. EPA, other Federal agencies and regional and state offices. Lists include U.S. EPA priority lists, lists of regional concern, inorganic compounds, and organic compounds. You may view the Individual chemicals within a list by clicking on the 'Chemical List Index' hotlink located directly above the Chemical List selection boxes. See the section on "Using Selection Boxes" if you need help selecting a chemical list or lists.

To add a chemical from the menu, select a chemical then click the fish facing to the right. This will place the chemical in Chemicals Selected list. To remove a chemical, select a

chemical in Chemicals Selected then click the left pointing fish. You may select multiple chemicals by holding the control or shift key. To unselect, hold control key and re-click.

To browse the specific chemicals used in the Predefined Chemical List selection box, view the Chemical List by clicking on the hyperlink above the selection box.

Example Chemical Selection Strategies

By clicking on the 'Chemical' button at the top of the Advanced Query page, you will move to the Chemical Search screen. The following examples will provide some guidance when conducting a chemical search.

- In the case of metal compounds, it may be easier to search by chemical name. Suppose you want to search for copper compounds. Entering *cupr* and *copper* as chemical names will find copper and several copper compounds with fewer keystrokes than typing all the individual CAS Registry numbers. You may also search a group of copper compounds using the ECOTOX Predefined chemical list feature.
- In some cases, organic compounds may be searched by chemical name. Suppose you want to search on all dioxin compounds. Entering *dioxin* as a chemical name will be more efficient than entering all the specific dioxin chemical names or CAS Registry numbers. Remember, though, entering some chemical names may identify many non-applicable chemicals (e.g., benzene will result in all compounds with the sub-string benzene in the chemical name). You may want to use the Collective Index (exact) search category for very specific names (e.g., benzene, xylene) when you do not want all the chemical derivatives.
- For pesticides, most synonym names are not in the Browse Chemical index file and using the CAS Registry number is the only method to effectively search ECOTOX. Chemical CAS Registry numbers may be located in chemical company catalogs or other chemical indexing resources. For example, searching chemicals by the common name, such as lindane, diazinon, atrazine or malathion will not locate any records in ECOTOX unless you locate the CAS Registry number for each and then perform a CAS Registry number search. If you are unsure of a CAS Registry number or chemical name, you may interactively use the Browse Chemicals index to search on chemical names or fragments of names.

Species Searching

Within ECOTOX you may conduct a search by entering the Species Number(s), Scientific Name(s), or Common Name(s). To browse Species Numbers, Scientific Names, or Common Names available in the database, browse our [Species Index](#). See section below on use of the Species Index for further information on this file. To conduct a search, type in

the species name or number and select the appropriate data type from the drop down list. Partial species names can be added using the "Type Name" selection from the drop down menu whereas an exact match is necessary using the "Type Name (Exact)" selection from the drop down menu. The default within ECOTOX is that all species are selected for searching. Unlike the chemical file, the ECOTOX species file includes historical synonyms for the species. If a search is conducted using a species name that is no longer deemed correct by taxonomists, the ECOTOX database will present the results using the currently acceptable genus and species name.

The default within ECOTOX is that all species are selected for searching. To conduct a search on a particular species you must identify the organism one of four ways: kingdom, species number, Scientific name or common species name. Although it is faster and more efficient to search by species number this may not always be a realistic option, in which case, searching by Scientific name and common name may be necessary. See the examples below for further explanation.

If more than five species need to be entered, click on the "Add more entries" button in the Advanced Database Query. This will take you to a page where you can enter as many species as needed. See section below on use of the Advanced Species searching for further information on entry of lists of species.

Scientific name: All data records within ECOTOX include a Scientific name for the test species. All names have been verified in reliable taxonomic sources. You can conduct an exact search on the scientific name (Scientific name (exact)) or search on fragments of scientific names, genus, or species names (Scientific name) by selecting the proper search option from the 'choose category' list. ECOTOX includes links to scientific name synonyms, but searches will retrieve all records associated with the selected scientific name including old taxonomic terminology.

Common name: All data records within ECOTOX include a common name for each species. You can conduct an exact search on the common name (Scientific name (exact)) or search on fragments of common names (Scientific name) by selecting the proper search option from the 'choose category' list.

Species Number: All species in the ECOTOX database have been assigned a unique number. Numbers can be located by using the 'Browse Species' option.

Using the Browse Species Index

By clicking on the 'Species Index' hotlink above the search box, a new browser window will open and you will have access to the ECOTOX species information file. This tool assists you in planning your species search strategy by allowing you to enter different Scientific and common species names or name sub-strings to determine whether or not your species is in the ECOTOX database and what other species will be included if your sub-string is used. For example, by entering the species Scientific name '*Ceriodaphnia reticulata*' the following species numbers and Scientific names will be included in your search results:

963 *Ceriodaphnia reticulata*
 2371 *Ceriodaphnia dubia* - *Ceriodaphnia reticulata dubia* (Historical Name)

You can then use the names provided in the output to perform your searches, or use the species numbers listed by each name.

Advanced Species Query The Advanced Species search allows you to enter more than five species search criteria in a single query. To access the Advanced Species Query, click on the "Add More Entries" box located directly below the species entry boxes. The Advanced Query screen allows you to search for any number of entries! All entries must be of the same category (Scientific Name, Common Name or Species number) and each species search criteria must be on its own separate line.

Enter the species search criteria, placing each entry on a separate line. The data retrieved will include species with names having any part of the words given in the textbox (i.e., a search on the word *daphnia* will return both *daphnia* and *ceriodaphnia*) An example has been provided on the correct method of entering the data.

Advanced Species Query

! Scientific Name	" Common Name	" Species Number
Pimephales promelas		
Daphnia		
Salmo		
Oncorhynchus mykiss		

If you are storing your species records in another source (like a spreadsheet), you may cut and paste the values into this box just like any other Windows application. For example, taking the information from an Excel spreadsheet you would:

- Highlight all of the items in the spreadsheet (please keep it to one column).

- Press CTRL+C (or select Copy under the Edit Menu).
- Bring up the Advanced Query page.
- Click in the Text Box (so the cursor is blinking in the box).
- Press CTRL+V (or select Paste under the Edit Menu).

Example Species Searches

By clicking on the 'Species' on the menu at the top of the search page, you will move to the Species Search screen. The following examples will provide some guidance when conducting a species search.

Scientific Name Searches

- Entering *Pimephales promelas* in the Scientific name search will result in only data for fathead minnows. If you consistently use a limited number of species names, you may want to use the species number for searching as it results in faster more efficient searches.
- Using the genus name may be helpful when interested in a broader search. Entering *daphnia* in the Scientific name search will result in all Daphnia and Ceriodaphnia species.
- You may also enter a historical Scientific name and still retrieve data for a species. For example, if you enter *Salmo gairdneri* and retrieve the data, the output will display the currently accepted name, *Oncorhynchus mykiss*.

Common Name Searches

- Common names may be efficient, if there is a unique common name for that organism. Entering *mallard* in the common name field will result in only mallard duck results.
- Entering the term *duck* will output results for *duck* and *duckweed*. In this case, searching using the common name (exact) or selecting only on the terrestrial habitat will eliminate the duckweed from the search.
- Entering *bird* in the common name field will result in *bird* and *ladybird beetle* data. In addition, using the term *bird* will not ensure that all bird data in the system will be extracted because the species name may not use the term *bird* in the common name.

Species Number Searches

- The species number is the unique indexing number assigned to each species in ECOTOX and is the most computationally efficient method of searching for species data. The species number may be useful if you consistently search on the same set of species. The best way to determine species numbers is to browse the Species Index.

Test Conditions

For each toxicity test record, pertinent information on testing procedures presented by the authors are encoded within the database. Several of these parameters can be used to select data within ECOTOX. Use this page to define search criteria related to test location, exposure media, exposures type and method of chemical analysis.

The options for searching by test conditions are briefly described below. These options are only available in the Advanced Database Query. For additional information about these parameters, please refer to the ECOTOX Data Field Definition document. Many of the test conditions require the use of selection boxes on the search form, for help in using these see "Using Selection Boxes."

Test Location

The valid entries for test location are Lab (laboratory), Field (all outdoor field tests, artificial, natural or undeterminable) and Not Reported (i.e., the author(s) did not present sufficient information to determine test location). The default within ECOTOX is that all data, regardless of test location, are included in your search result. You may override the default and selectively search up to five specific test locations. To selectively search on a specific test location, click to mark the appropriate checkbox.

Exposure Media

The default within ECOTOX is that all data, regardless of test media, are included in your search result. To selectively search on a specific exposure type, use your mouse button to mark the appropriate checkbox.

Aquatic freshwater tests include those conducted in freshwater, reconstituted water, distilled water, or tap water. Saltwater tests include those conducted in natural or artificial seawater, brackish water, or estuarine water. Not Reported (NR) is used if a determination cannot be made regarding the use of either freshwater or saltwater.

Terrestrial exposure media selections are focused on tests using a substrate (e.g., soil or artificial media). If the terrestrial organism does not utilize a substrate for nutrition (e.g., birds, mammals), do not select any exposure media types. Please refer the ECOTOX Code List, to locate the exposure media categories available for searching.

Exposure Type

You can select the exposure type by clicking the items in the menu box. Organisms are typically exposed to toxicants through aqueous, diet, injection, inhalation, topical or environmental routes. Occasionally, an exposure may be through multiple routes (e.g., such as topical and oral).

ECOTOX includes chemical exposures on whole living organisms. *In vitro* assays are not included. The terrestrial plant database contains some studies using excised organs and cell cultures from plants, but these types of studies are not actively coded at this time. Please refer the ECOTOX Code List, to locate the exposure types available for searching.

Method of Chemical Analysis

The method of chemical analysis allows you the capability to filter out test records based on whether or not the authors reported chemical concentrations as measured or nominal values. Select the appropriate checkbox from the following options:

Measured - Exposure and/or observation concentrations or doses are quantitative; analysis methods may be reported.

Unmeasured - Exposure and/or observation concentrations or doses are clearly identified as nominal values; or when the author does not report whether the concentrations were measured or nominal, i.e., unmeasured is used as a default value when there is no information provided about the reported chemical concentrations.

Not Reported - Exposure and/or observation concentrations or doses are reported as both the measured and the unmeasured values but it is not clear whether observation/response dose is a measured or nominal value.

Test Results

For each toxicity test record, pertinent information on test results presented by the authors are encoded within the database. Several of these parameters can be used to select data within ECOTOX. Use this page to define search criteria related to test results for endpoints, effects and documentation codes.

Endpoint

For the purposes of the ECOTOX database, an endpoint (e.g., LC50) is defined as "the quantification of an observed effect obtained through statistics or other means of calculation for the express purpose of comparing equivalent effects." The default within the ECOTOX

Database is that all endpoints are selected for searching. To conduct a search on a particular endpoint you must go to the Endpoint search section (Advanced Query) and move the desired endpoint(s) to the Endpoint Selected box. To select an endpoint, click an endpoint in the Endpoints Available window then click the right fish. This will place your selection in the Endpoints Selected window. To remove a selected effect, click an endpoint in the Endpoints Selected window then click the left fish.

You may select multiple endpoints by holding down the control or shift key when selecting. To remove a selected endpoint, hold control key and re-click. At the bottom of the Endpoints Selection box in the Advanced Database Query and at the bottom of the Effects box in the Quick Database Query, is a checkbox 'Report Endpoints Only.' Selecting the "Endpoints Only" option restricts the search results to those test records, which have an associated endpoint.

Effect

For the purposes of the ECOTOX database, a toxicological effect (e.g., mortality) is defined as "the observation of a response resulting from the action of a chemical stressor."

The default within the ECOTOX database is that all effects are selected for searching. To conduct a search on a particular effect you must go to the Effect search within the Advanced Database Query and select the desired effect(s). Use Browse Effects or the ECOTOX Code List (PDF) to locate Effect Groups and associated effect measurements.

Effect Group:

The ECOTOX database categorizes all observed effects under at least one of ten major effect group codes (accumulation, behavior, biochemical, cellular, growth, mortality, physiology, population, reproduction, and ecosystem). The option to select based on an effect group is available in both the Quick Database Query and Advanced Database Query. A limited number of test records report calculated endpoints, but the authors do not specifically state the observed effect. These records are included in the "No Effect Group." By clicking on the major effect group box, you select all effects under that grouping. To select an individual effect, click on the appropriate effect selection box. To deselect any selection, click on a selected checkbox.

Effect Measurement: (Advanced Query only)

For further refinement of observed effect information, you may click on the Effect Measurement Search button located directly below the Effect Search menu. The Effect Measurement Search window provides a listing of specific measurements for each of the

selected effect(s) and/or effect group(s). Measurements include quantitative observations that describe and evaluate biological responses to toxicants. Each effect (e.g., Growth) can have several associated measurements (e.g., length, weight). The ECOTOX Code Appendix provides definitions of the effect measurement codes used in ECOTOX.

The Effect Measurement Search window lists all of the individual measurements for each effect and/or effect group, which you selected in the Effect and Measurements box. To search on a specific measurement, highlight the measurement in the Measurements Available box by clicking on it, and move it to the Measurements Selected box by clicking on the fish facing right. You may select more than one measurement at a time by selecting the first measurement and holding down the shift key and clicking on the last measurement. All measurements in between will be selected. You may deselect measurements by reversing the process. If you do not move any of the measurements to the Measurements Selected box, a search will be conducted on all measurements in the Measurements Available box; i.e., those associated with effects and/or effect groups you have previously selected. When you are done, you may use your browser's back button go back to Test Results.

Recovery Results

Within the Effects menu (Advanced Query) the 'Include Recovery Results' option allows you to include in your search results responses observed during a post exposure period. This is only available for aquatic test results. If this option is not selected, your ECOTOX search results will only include effects observed during the direct exposure period of the study. The Recovery Results are included by clicking on the checkbox. Recovery results are indicated in the aquatic report by the placement of a tilde(~) character before the effect code (e.g., ~MOR).

Documentation Codes

The ECOTOX documentation codes indicate the completeness of methods documentation and results presentation accompanying the data. Documentation code assignments range from Complete (C) to Moderate (M) to Incomplete (I). The documentation codes are assigned automatically within ECOTOX based on the author(s) reporting of information related to test methods and results. The default within ECOTOX is that all data, regardless of documentation code, are included in your search result. You may override the default and selectively search up to two specific documentation codes. To selectively search on a specific documentation code in the Advanced Query, click to mark the appropriate checkbox.

Publications

For each toxicity test record, pertinent publication information is coded. You may use this search criterion to narrow the search for a specific publication.

Reference Number

Each publication abstracted for the ECOTOX database effort is assigned a unique reference number. These reference numbers appear in all default ECOTOX outputs. You may conduct searches on specific reference numbers for publications associated with the ECOTOX database. To selectively search on a specific reference number, enter the specific reference number(s) in the boxes provided. This option is only available in the Advanced Database Query page. If a reference number is not specified in this search window, the ECOTOX default is to conduct a search on all reference numbers in the database.

Publication Year

The aquatic component of ECOTOX contains data from publication years 1915 to present; the terrestrial component of ECOTOX contains data from publication years 1926 to present. The default within the ECOTOX database is that all data, regardless of publication year, are included in your search result. You may override the default publication year search by either selecting years from the 'Publication Years Available' box and moving them to the 'Selected Box', or by entering a range of years in the 'Starting Year' and 'Ending Year' boxes. To add a publication year from the menu, select a publication year in the Publication Years Available list then click the fish facing to the right, thereby moving the selected item to the Publication Years Selected list. To remove a publication year, select a publication year in Publication Years Selected then click the left fish facing to the left. You may select multiple publication years by holding the control or shift key when selecting parameters. To unselect, hold control key and re-click. Note that a range of years may be used instead of menu entries, or may be used in combination with menu entries.

The publication year option also allows you to enter a range of data. This option appears directly below the Selection Boxes. You should enter the bordering inclusive years of your range in the "Starting Year" and "Ending Year" boxes (e.g., 1994 through 1998).

SORT ORDER

The data are sorted within the aquatic and terrestrial reports in a predefined way. Sort order modifications are not available within the ECOTOX software. If you require a more specific sort, download your search in a delimited file format (See Report Format section) and upload the file into a spreadsheet or database on your PC. Use your spreadsheet or database software to sort your data.

For the aquatic test result outputs, the default sort order is Test Location, Level of Calculated Results Reported, CAS Registry number, Species Scientific name, Endpoint, Effect, and Exposure Duration. Due to the default Level of Calculated Results sort, data with calculated endpoints, will be presented first, followed by data with statistical analysis or percent (%) effects reported and finishing with ranged data or observed effect results that were not analyzed further by the authors. The Test Locations sort separates the report into records not reporting a test location, Laboratory studies and Outdoor Field results.

The terrestrial report is sorted into multiple pages by Chemical Name, Species Scientific Name, Publication Year, and Reference Number fields. Remember, the Sort Order does not change the data, it just changes the order in which the data appear in the report.

REPORT FORMAT

Report content modifications are only available in the Advanced Database Query page. Above each output selections box, is a checkbox that allows the user to modify the format of the report output. This option allows you to change the output fields as they appear in the report. The individual default fields vary for each database. Output field selections are set at a default which will print the data in a table format with headings. The report width is defined by the data fields and the Web browser settings selected, so carefully modify the output fields to fit within your preferences.

Under the Report Format option within the Advanced Database Query, you may choose the data fields you want to include in the report and the report style: i.e., either the tabular format (the default) or delimited file format (use to import data into spreadsheets and databases). The default report is in a table format and provides most data fields that you will need to gain a general understanding of the test record. Each data field in the delimited file format is separated by the '|' character (usually located on the \ key). Delimited ASCII files can be saved to your hard drive and uploaded into your local spreadsheet or database software.

ECOTOX also has a default sort that presents the data in a manner useful to most clients. If the data needs to be sorted further, please select the delimited file output format and perform the sorting within a spreadsheet or database. Please note that for terrestrial data, additional output parameters may only be selected if the report format is a delimited file.

To select additional parameters to include in your report, highlight the parameter in "Fields Available" then click the fish facing the right. This will place your selection(s) in the "Fields Selected" box. To change the location of a parameter within a report header (not sort order), highlight the parameter and click Move Up or Move Down until the data field is in the desired location. To remove a selected item, click a selection in Output Selected then click

the fish facing the left. You may select multiple output selections by holding the control or shift key when selecting. To remove a selection, hold the control key and re-click.

The Reference Citation field adds a separate section to the end of the report, which contains a bibliography of all the references associated with the reported data records. Reference Citation field will appear in the delimited data format files in four separate fields (Author, Title, Publication Year and Source).

Aquatic Report

The aquatic default output fields for test records reporting a test location as 'not reported' or laboratory are Test Location, CAS Registry Number/Chemical Name, Scientific Name/Common Name, Endpoint, Effect, Trend/Effect %, Water Type, Duration/Exposure Type, Concentration Type/Value, Significance/Level, and Tissue/BCF, Reference Number and Reference Citation. See Appendix D for a sample of the aquatic default report.

For outdoor field exposures, the aquatic default output fields are Test Location, CAS Registry Number/Chemical Name, Scientific Name/Common Name, Endpoint, Effect, Trend/Effect %, Exposure Type, Duration/Exposure Type, Concentration/Application Rate, Application Type, Application Frequency/Date, Significance/Level, Site/BCF, Reference Number and Reference Citation.

Terrestrial Report

The default terrestrial report includes most available terrestrial fields. You may only modify the output fields in the delimited file report format. You may need to reformat your web browser software to landscape format or modify your font when you print a hard copy of your report. See Appendix E to view the terrestrial report defined fields and a sample terrestrial default report.

PERFORM QUERY

Review Query

Before conducting a search using your selected criteria, you may want to review your search strategy by clicking the Review Query using the graphic at the top of the page. Finally, before submitting your search strategy for retrieval, be sure you have made any desired changes to the Report Format. For documentation purposes, you may want to print the Review Query information and attach it to the reports that are generated using that criteria.

Report Selections

Three output options are available; browser viewable report (multiple page format), generate entire report (one page format) and exporting a delimited data file. The default report format is set to interactively view the output in the multiple page report format. Once the search has been implemented, a separate browser window will be opened for display of your search results.

Browser Viewable Report

The browser viewable report (default) presents your search results in a separate browser window after the search has completed. The report may then be viewed, printed or saved to a file using the File menu option on your browser. Your first page of your data records are always displayed below the report header information.

You can move through the report in a number of ways. To view a page from the report, scroll through it by using the scroll bar on the right side of the window. The output window will provide hyperlinks to each page of the report. The output window will also provide hyperlinks to the first pages of the laboratory, outdoor field and reference sections of the report. String searches may also be performed by clicking the Web browser Edit menu on the top window Tool bar and using the Find In Page option.

To print a report, select the browser File menu and select the Print option. To save the report as a file, use this same File menu and choose the Save As option. It should be noted that each page identified in the browser window may actually contain several printable pages (e.g., page 1 when printed may result in 18 printed pages). Additionally, you must click each page identified in the browser window in order to view, print or save all downloaded records.

The ECOTOX software cannot control your web browser print function and field width. Successfully printing output is dependent upon your web browser preferences and/or your printer capabilities. These options can help to fit your report on a printout:

- Reduce your web browser font size.
- If your report width is wider than a portrait page size, you can modify your web browser print option to a landscape orientation
- Some web browsers have a Print Preview option for use in viewing the actual look of the output.
- You may want to consider using the delimited file option, then merging/adjusting the columns or selecting fewer output fields.
- If you are using Internet Explorer, choose *View->Fonts->Smallest* from the menus and then print in landscape mode. This will work for very wide reports. Note that Netscape

allows you to reduce the font size as well, but when it prints it reverts to the original font size and truncates the right side of the report.

- Some printers have advanced settings available from the print window that allow you to "scale" the print image. If this feature is available, try different values to determine which one works best for your reports.
- Save the browser report as a ".htm" file and open it with a word processing application where the font size can be reduced and column sizes adjusted.

The data file will contain data representing the specific search and report format you have selected. Each report will include contact information for the ECOTOX Support Staff, date of the search, number of records in the report and number of separate browser window pages.

Generate the Entire Report

You may also select to generate the entire browser viewable report on a single viewable/printable page. This option is generally used when you want to electronically save the entire data report as a single file. Reference citations are viewed/saved as a separate page. We do not recommend this format, because large reports may overload your browser causing instability in your browser or computer.

Delimited Report

This option allows you to generate an ASCII delimited data file of your search results. The exported data file may be imported into spreadsheet or database software for use on your personal system.

When you retrieve the results of your search in a delimited format a message box will appear on your screen. Select 'Save file.' A 'save as' window will appear. Select the appropriate directory on your hard drive. You may change the file name at this time. Although *.tsv stands for Tab Separated Values, the report is actually a vertical bar (|) delimited file. A help window for using the delimited file will automatically open when you are saving a delimited file from ECOTOX. You may wish to print this out for later use when importing the data into a spreadsheet/database.

Each field in the delimited file report will be separated by a vertical bar (|) and each record will appear on a separate line. Using the vertical bar as a delimiter between fields is typically not the default method supported by applications that import data (e.g., spreadsheets) and hence you may have to specify the vertical bar as the delimiter when you import the data. The vertical bar key is usually found on the same key as the "\" (backslash) character on most keyboards and may appear as two shorter vertical lines with a gap between them.

To import a delimited file into a Microsoft Excel spreadsheet, you should do the following:

1. Start the Spreadsheet
2. Go to the menu choice File->Open
3. Change the file types to "All file types (*.*)"
4. Select the file
5. Choose a delimited file format
6. Choose a vertical bar (|) as the field delimiter
7. Click Finish

Your file should now be imported into a spreadsheet for your analysis. A forward slash (/) within a field refers to an associated comment. These comment fields are currently not available for download. You will need to view the full publication for proper interpretation.

Perform Query

Click the Perform Query graphic when you are ready to initiate your search strategy and create a report/output. While the system is performing the ECOTOX database search, a separate window is created indicating that an ECOTOX database search is taking place. When the search is complete, the appropriate results (report contents or data file name) for aquatic and/or terrestrial report(s) will appear in this separate window. Information about how to retrieve your report will display:

- The 'Aquatic Data' and 'Terrestrial Data' boxes, located at the top of this page, provide status information on your query.
- Once the reports are completed, click on one of the boxes and the search results (either aquatic or terrestrial) will be displayed in the bottom section of this page.
- You may need to scroll down to view the entire page. Also, the report will span more than one page; click on the 'Next' or page number buttons to move through the output.
- Close this window before conducting a new search.
- If your search is too large a report will not be presented. There is a maximum number of 500 terrestrial and/or 5000 aquatic records that can be retrieved in one browser viewable search or delimited search using the quick query.
- Using the advanced query, the delimited export file will retrieve up to 10,000 terrestrial or aquatic records.

As the search is being conducted, the system will display the number of records located for aquatic and/or terrestrial species. If the number of records is larger than you would like to view, you may click the 'Stop Search' button at the top of the report window and return to the

ECOTOX Database window and refine your search strategy. If you have selected the default outputs format (web browser view screen) the number of data records that can be included in the reports are 5000 for aquatic data and 500 for terrestrial data. The delimited export file will retrieve up to 10,000 terrestrial or aquatic records.

Once each report is completed, the banner at the top of the window will become visible with the words 'the Aquatic / Terrestrial report is ready.' Click on either the Aquatic or Terrestrial graphic to view the respective reports. If you are using a browser viewable report format, the report will appear directly below the header on the report window. If you have selected a delimited file format, a box will appear prompting you that the file is about to be downloaded and a window with instructions for downloading and using the delimited files will appear.

The number of hits you retrieve is based on test records and not references. Your browser viewable output may span several pages with multiple test records within each page. The reference citations for your entire search will be located on the last page of the browser viewable report. If you have selected the delimited file format, the citation information will be downloaded within the delimited file.

Clear Query

Once you have completed your search, and closed the report window, you will be returned to the ECOTOX database window. The search strategy will remain intact, so you may go back and refine your search if you wish. If you want to conduct another search, you may clear the search by clicking the 'Clear Query' graphic at the top of the search window. Clearing the search will return all search options to their original default values.

USEFUL WEB SITES

Under the About ECOTOX/ Help link, there is an option to look at other toxicology related sites on the World Wide Web. Providing links to these sites does not imply endorsement by the U.S. EPA.

EXIT FROM ECOTOX

Exiting your Web browser or visiting another Web site will leave the program. Exiting the Web browser will not save the last search strategy.

APPENDIX A: ECOTOX SEARCH PLANNING FORM

Use this form to simplify the planning of your searches or to document searches for others to perform.

Search Options:

Kingdom: ANIMALS ____ PLANTS ____
Habitat: AQUATIC ____ TERRESTRIAL ____
Independently Compiled Data: Dutch ____ EPA Fathead Minnow ____ French ____ German ____
Office of Pesticide Program Database ____
Recent Modifications/Additions: _____

Chemical:

CAS Numbers: _____
Chemical Names: _____
Predefined Chemical List: _____

Species:

Species Numbers: _____
Scientific Names: _____
Common Names: _____

Test Results:

Endpoints: _____

Effect Groups:

____ Accumulation	____ Mortality
____ Behavior	____ Physiology
____ Biochemical	____ Population
____ Cellular	____ Reproduction
____ Growth	____ Ecosystem

____ Additional Effects and Measurements _____

Recovery Results: ____ Include Recovery Results for aquatic data

Documentation Codes: ____ Complete ____ Moderately Complete ____ Incomplete

Test Conditions:**Test Location(s):**

____ Lab ____ All Field Tests
____ Field Artificial
____ Field Natural
____ Field Undeterminable

Exposure Media:

WATER: ____ Freshwater ____ Saltwater ____ Unknown
SOIL: ____ Artificial ____ Humus ____ Litter ____ Manure ____ Mineral Soil ____ Mixture ____ Natural Soil
____ Unspecified Soil
ARTIFICIAL: ____ Hydroponic ____ Other ____ No Substrate

Exposure Type:

- ☐ Diet ☐ Flow-through (aquatic)
☐ Injection ☐ Leaching (aquatic)
☐ Topical ☐ Intermittent (aquatic)
☐ Environmental (terrestrial) ☐ Renewal (aquatic)
☐ Inhalation (terrestrial) ☐ Static (aquatic)
☐ Multiple Entry (terrestrial) ☐ Tidal (outdoor aquatic)
☐ Lentic (outdoor aquatic)
☐ Lotic (outdoor aquatic)

Chemical Analysis Method: ☐ Measured ☐ Unmeasured ☐ Not Reported

Publications:

Publication Years: _____

Reference Number(s): _____

Report Format:

Output Format:

- ☐ Browser Viewable Report - Multiple viewable pages
☐ Browser Viewable Report - Single viewable/printable page
☐ Delimited Report - used for importing into other software applications (e.g. Excel, Lotus etc.)

Field Output Selections: Standard default output elements are listed in bold. Some aquatic output options are available for Field Data only, and are indicated by (Field Data Only). Modifications to report options are only available in the Advanced Query.

Aquatic Output Elements (default report items are in bold)	Terrestrial Output Elements (default for browser viewable or delimited are in bold) (modify for delimited output only)
<input type="checkbox"/> Test Location <input type="checkbox"/> CAS Number/Chemical Name <input type="checkbox"/> Scientific Name/Common Name <input type="checkbox"/> Endpoint <input type="checkbox"/> Effect <input type="checkbox"/> Trend <input type="checkbox"/> Exposure Type <input type="checkbox"/> Exposure Duration <input type="checkbox"/> Media Type <input type="checkbox"/> Concentration Type <input type="checkbox"/> Concentration/Application Rate (Field Data only) <input type="checkbox"/> Application Type (Field Data Only) <input type="checkbox"/> Application Frequency (Field Data Only) <input type="checkbox"/> Application Season/Date (Field Data Only) <input type="checkbox"/> Significance/ Level <input type="checkbox"/> Response Site <input type="checkbox"/> Reference Number <input type="checkbox"/> Application Rate (Field Data Only) <input type="checkbox"/> Alkalinity <input type="checkbox"/> BCF Value	<input type="checkbox"/> Application Frequency <input type="checkbox"/> Basis of measurement (wet/dry) <input type="checkbox"/> CAS Number <input type="checkbox"/> Chemical Analysis Method <input type="checkbox"/> Chemical Name <input type="checkbox"/> Chemical Comment <input type="checkbox"/> Chemical Formulation <input type="checkbox"/> Chemical Grade <input type="checkbox"/> Chemical Purity <input type="checkbox"/> Concentration/Dose <input type="checkbox"/> Control Type <input type="checkbox"/> Documentation Code <input type="checkbox"/> Dose Number <input type="checkbox"/> Dose Statistical Method <input type="checkbox"/> Effect <input type="checkbox"/> Effect Measurement <input type="checkbox"/> Endpoint <input type="checkbox"/> Exposure Dose <input type="checkbox"/> Exposure Duration <input type="checkbox"/> Exposure Number

___ Chemical Analysis Method	___ Exposure Comment
___ Chemical Comments	___ Exposure Type
___ Control Type	___ Gender
___ Documentation Code	___ Ionic Fraction
___ Effect %	___ Lifestage
___ EE Comment	___ Media Type
___ Experimental Design	___ Observation Duration
___ GEO Code (Field Data Only)	___ Observed Response
___ Geographic Location (Field Data Only)	___ Organism Age
___ Habitat Code	___ Organism Comment
___ Habitat Description (Field Data Only)	___ Organism Source
___ Hardness	___ Publication Year
___ Test Number	___ Reference Citation
___ Longitude/Latitude (Field Data Only)	___ Reference Number
___ Organic Carbon	___ Response Site
___ Organic Carbon Type	___ Result Comment
___ Organism Comment	___ Result Percent Lipid
___ pH	___ Result Percent Dry/Wet Weight
___ Publication Year	___ Result Record Number
___ Reference Citation	___ Result Statistical Method
___ Salinity	___ Reviewer Assigned Endpoint
___ Species Number	___ Sample Number
___ Study Type	___ Significance/ Level
___ Substrate Code (Field Data Only)	___ Soil Cation Exchange Capacity
___ Temperature	___ Soil Concentration Measured
	___ Soil Moisture
	___ Soil Organic Matter
	___ Soil pH
	___ Soil Clay %
	___ Soil Sand %
	___ Soil Silt %
	___ Species Common Name
	___ Species Scientific Name
	___ Species Number
	___ Study Duration
	___ Test Comment
	___ Test Location
	___ Test Number

APPENDIX B: EXAMPLE SEARCHES

Use this form to simplify the planning of your searches or to document searches for others to perform. After each example search, remember to click on “Clear Query ” before proceeding to the next search. These examples are for you to try in the Advanced Query pages.

Example A

You want to locate all reproductive effects data for nickel compounds. What types of reproductive effects were measured?

1. Click on Chemicals hotlink from the menu. Scroll down to Predefined Chemical Lists. Select **MERCURY** from the metals list, then click on right fish graphic to move “Mercury” to the selected list.
2. Click on “Test Results” hotlink from the menu. Scroll to the Effects list. Click on Group Effect **REPRODUCTION**. This will display and select all the reproductive effects within ECOTOX.
3. For Aquatic data, click on menu Report Format graphic. Select **EE COMMENT** from the Aquatic laboratory and field selection lists, then click on right fish graphic to move “EE Comment” to the selected list. The Terrestrial data report the specific measurement in the default report.
4. Click on “**Perform Query**” graphic

Example B

You want to locate LC50 data on freshwater organisms exposed to malathion.

1. Click Database hotlink from the menu. Select **AQUATIC** habitat type radio button.
2. Click Chemical hotlink from the menu. Type in CAS Number: **121755** in the Chemical Entry box
3. Click Test Results hotlink from the menu. In the Endpoint menu, select **LC50** from the list, then click on right fish graphic to move “LC50 ” to the selected list.
4. Click Test Conditions hotlink from the menu. Scroll down to the Exposure Media page and click on **FRESHWATER** checkbox.
5. Click on “**Perform Query**” graphic.

Example C

You want to locate recently published, well documented lethality endpoint only studies on Daphnia magna.

1. Click Database hotlink from the menu. Select **AQUATIC** habitat radio button.

2. Click Species Criteria hotlink on the menu. Type in **DAPHNIA MAGNA** and select the Scientific name category.
3. Click on Test Results hotlink from the menu. In the Endpoint selection box, select the **REPORT ENDPOINTS ONLY** checkbox.
4. Scroll down to the Effects selection area and click on the **MORTALITY** Effect Group checkbox.
5. Scroll down to the Documentation Codes selections and click on the checkbox for **COMPLETE** to obtain all well documented publications.
6. Click on Publications hotlink from the menu. Scroll down to publication year search. Select **2002, 2001, 2000, 1999, 1998** from the list, then click on right fish graphic to move them to the selected list. Another method of searching multiple publication years is to type in the range of years (**1998 to 2002**) at the bottom of this menu.
7. Click on **“Perform Query”** graphic.

Example D

You want to locate toxicity data for frog tests performed in an outdoor location. You would like to move these data records into your own database.

1. Click on the Species hotlink from the menu. Enter **FROG** in the species selection box, and select 'Common Name' from the 'Choose Category' list. Note: If you only want larval aquatic lifestage, specify the aquatic habitat; adult terrestrial lifestage specify the terrestrial lifestage.
2. Click on the Test Conditions hotlink from the menu. In the Test Location area, select the checkbox **ALL FIELD TESTS** from the list.
3. Click Report Format graphic. Scroll down and click on the **DELIMITED REPORT** option.
4. Click on **“Perform Query”** button.

Example E

You want to use the SARA Title III Toxic Emissions Inventory chemical list and locate data that are in the EPA Fathead Minnow Database.

1. Click on Database hotlink from the menu. Select the **EPA FATHEAD MINNOW ACUTE TOXICITY DATABASE** checkbox within the Independently Compiled Data selection box.
2. Click on Chemical hotlink from the menu. Scroll down to Predefined Chemical Lists. Select **SARA TITLE III LIST** from the list, then click on right pointing fish graphic to move it to the selected list.
3. Click on **“Perform Query”** graphic.

APPENDIX C: INDEPENDENTLY COMPILED DATA FILES

Some independently compiled data sets have been transferred into ECOTOX from external sources. The data sets must meet the ECOTOX data parameter and quality assurance guidelines. Data sets available in ECOTOX are:

The U.S. EPA MED data set includes the Acute Toxicity of Organic Chemicals file which contains data for a single test species (30-day fathead minnow). The U.S. EPA Office of Toxic Substances is acknowledged for long-term support in the generation of all acute toxicity data for organic chemicals. All test results, including data not available on-line, have been compiled in five volumes titled: Acute Toxicities of Organic Chemicals to Fathead Minnows (*Pimephales promelas*), available from the Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI.

International cooperative efforts are underway with the Organization for Economic Cooperation and Development (OECD) and the Commonwealth of Independent States (Borok Institute) in order to enhance the review of the International literature. Data files from France, Germany, the Netherlands and Russia are received and incorporated into ECOTOX on an ongoing basis.

The Office of Pesticide Program's Pesticide Ecotoxicity Database (formerly Environmental Effects Database) is a compilation of the toxic effects data for registered pesticides. These data have been reviewed and categorized as acceptable for fulfillment of pesticide registration and re-registration guideline requirements as explained under FIFRA Subdivision E, Parts 158.145 and 158.150. Data for the Pesticide Ecotoxicity Database are drawn from several sources. The major portion of the data is derived from actual Agency reviews of toxicological studies conducted by commercial laboratories and submitted by pesticide companies in support of their products. The U.S. EPA conducts audits of these laboratories on a periodic basis through the U.S. EPA Office of Compliance and Monitoring. A second major source of data entries is the numerous studies conducted by U.S. EPA, USDA, and U.S. FWS laboratories over the last 25 years. A third, less utilized source is published data considered to meet our guideline criteria for acceptable data.

The U.S. Geological Survey, Biological Resources Division, Columbia Environmental Research Center (CERC) located in Columbia, Missouri (<http://www.cerc.usgs.gov/data/acute/acute.html>) database summarizes the results from aquatic acute toxicity tests conducted by this research facility. The acute toxicity test provides a relative starting point for hazard assessment of contaminants and is required for federal chemical registration programs such as the Federal Insecticide Fungicide Rodenticide Act (PL 80-104) as amended by the Federal Environmental Pesticide Control Act of 1972 (7 U.S.C. 136-136y) and the Toxic Substances Control Act of 1976 (PL 94-469).

The database was initially developed in 1986 by Foster L. Mayer and Mark R. Ellersieck for 4,901 acute toxicity tests conducted by CERC since 1965 with 410 chemicals and 66 species of aquatic animals. A report by Mayer and Ellersieck (1986) provides an interpretation of the original 4,901 toxicity tests which utilizes various statistical approaches to make taxonomic comparisons, and to assess the degree to which various factors (static versus flow-through, age of test solutions, pH, temperature, water hardness, and diet) affect toxicity (*Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals*, F.L. Mayer and M.R. Ellersieck, United States Department of the Interior, U.S. Fish and Wildlife Service, Resource Publication 160, 1986). This publication is commonly referred to as the "Gold Book".

The available data sets, available data, institution address and contacts are listed below:

Institution Contact Information	Data Summary and Reference Numbers
<p>EPA: Fathead Minnow Acute Toxicity Database (MED-Duluth)</p> <p>To obtain hard copies of the University of Wisconsin-Superior (UWS) volumes contact:</p> <p>University of Wisconsin/ Lake Superior Research Institute Contact: Dianne Brooke E-mail: dbrooke@staff.uwsuper.edu Phone: 715-394-8166</p> <p>For technical information on the database contact:</p> <p>U.S. EPA/ORD/NHEERL/MED Contact: Christine Russom E-mail: russom.chris@epa.gov</p>	<p>5 references (#3217, 12447, 12448, 12858, 12859);</p> <p>724 aquatic records</p>
<p>French (OECD-IRCHA)</p> <p>Ecotoxicology Department, INERIS Rue Lavoisier, B.P. 1 F-91710 Vert Le Petit France http://www.ineris.fr/en/index.htm Contact: Dr. Roger Cabridenc Phone: 33-1-45960956; Fax: 33-1-45960957</p>	<p>13 references (#20, 3397, 3516, 3517, 3518, 3519, 3520, 3521, 5161, 6771, 9170, 10724, 15300);</p> <p>256 aquatic records</p>

Institution Contact Information	Data Summary and Reference Numbers
<p>German (OECD) Umweltbundesamt, Federal Environmental Agency Dienstgebäude Berlin-Mitte Mauerstraße 45-52 0-1080 Berlin Germany http://www.umweltbundesamt.de/index-e.htm Contact: Ms. Cornelia Leuschner Phone: 49-30-89033219; Fax: 49-30-89033232 E-mail: cornelia.leuchner@uba.de</p>	<p>282 references (citation refers to OECDG Database); 8218 aquatic records 941 terrestrial records</p>
<p>Dutch (OECD) National Institute of Public Health and Environmental Protection (RIVM/ACT) PO Box 1, 3720 BA Bilthoven The Netherlands http://www.rivm.nl/index_en.html Contact: Dr. Hans Canton E-mail: ecocr@sb615.rivm.nl</p>	<p>17 references (#5180, 5331, 5333, 5336, 5337, 5356, 5367, 5370, 5374, 5375, 5378, 5390, 5400, 5411, 5414, 11039, 11044); 1990 aquatic records</p>
<p>Russia Borok Institute, Institute for Biology of Inland Waters, Academy of Sciences 152742 Borok, Nekouz, Yaroslavl Region Russian Republic http://www.ibiw.yaroslavl.ru/ Contact: Victor Komov E-mail: vkomov@ibiw.yaroslavl.su</p>	<p>55 references 255 aquatic records</p>
<p>EPA: Office of Pesticides Program Database (OPP) (Pesticide Ecotoxicity Database -formerly Ecological Effects Database) U.S. Environmental Protection Agency Office of Pesticide Programs Environmental Fate and Effects Division, Ecological Effects Branch 401 M St. SW Washington, DC 20460 http://www.epa.gov/ipbpages/archive/v.1/258.htm Contact: Brian Montague E-mail: montague.brian@epa.gov</p>	<p>1 reference (#344); 5593 aquatic records, 4377 terrestrial records</p>

Institution Contact Information	Data Summary and Reference Numbers
<p>USGS Acute Toxicity Database (Mayer & Ellersieck, 1986 - commonly referred to as the "Gold Book")</p> <p>For data format questions contact:</p> <p>Columbia Environmental Research Center U.S. Geological Survey 4200 New Haven Road, Columbia, Missouri 65201 Phone: 573-875-5399 (http://www.cerc.usgs.gov/data/acute/acute.html) Contact: Linda Sappington E-mail: linda_sappington@usgs.gov</p> <p>For data interpretation contact:</p> <p>National Health and Environmental Effects Research Laboratory U.S. Environmental Protection Agency - Gulf Ecology Division Gulf Breeze, Florida 32561 Phone: 850-934-9356 Contact: Foster L Mayer E-mail: mayer.foster@epa.gov)</p>	<p>1 reference (#6797);</p> <p>8761 aquatic records</p>

APPENDIX D: AQUATIC REPORT FORMAT

ECOTOX: Ecotoxicology Database
USEPA/ORD/NHEERL
Mid-Continent Ecology Division

Contact: T:218-529-5225 F:218-529-5003

E-mail: ecotox.support@epa.gov

It is recommended that users consult the original scientific paper to ensure an understanding of the context of the data retrieved from the ECOTOX database.

Report Generated: Sat Jun 8 08:18:19 2002

Records found: 1

1 2 NEXT > >

Laboratory Data References

Page 1 of 2

Scientific name, Common name	Endpoint	Effect Group	Media Type	Dur	Conc (ug/L)	Signif	Response Site	Ref #			
				Exp Typ		Level	BCF				
Test Loc: LAB											
CAS #/Chemical: 8001352, Toxaphene											
Pimephales promelas Fathead minnow	NR-LETH	MOR	FW	1.00 S	A 10			4777			
Scientific name, Common name	Endpoint	Effect	Trend Effect %	Water Type	Dur (days) Exp Typ	Conc (ug/L) Appl Rate	Appl Type	Appl Freq Date/Season	Signif Level	Tissue BCF	Ref #
Test Loc: FIELDN											
CAS #/Chemical: 298000, Phosphorothioic acid, O,O-Dimethyl-O-(p-nitrophenyl)ester											
Bufo marinus Giant toad		MOR	INC 63	FW	0.007 - 0.08 D O	A 280 0.32 AI kg/ha	AS	1X			17983
Tilapia mossambica Mozambique tilapia	NR-ZERO	MOR	NEF 0	FW	0.007 - 2.00 D O	A 2.3 - 280	AS	2X			17983

APPENDIX E: TERRESTRIAL REPORT FORMAT

ECOTOX: Ecotoxicology Database
USEPA/ORD/NHEERL
Mid-Continent Ecology Division

Contact: T:218-529-5225 F:218-529-5003

E-mail: ecotox.support@epa.gov

It is recommended that users consult the original scientific paper to ensure an understanding of the context of the data retrieved from the ECOTOX database.

Report Generated: Sat Jun 8 08:18:19 2002

Terrestrial records found: 4 **Page 1 of 2**

1 2 Next >>

References

NR = Not Reported

A study of **12 week(s)** duration using **natural soil** media was conducted in a **laboratory, indoor** site location with **NR** obtained ***Lumbricus rubellus*** (**Earthworm**). The **adult** (age: **NR** and organism characteristics of: **~700 mg**) were exposed for a duration of **12 week(s)** to a **NR** application of **Cadmium chloride** (CAS #: **10108642**) in **NR** carrier or a(n) **NR** positive control through a(n) **direct application** exposure route. The reported chemical concentrations are the result of **measured** analysis of chemical solutions and are based on the **NR** ion. The **natural soil** was comprised of **NR** sand, **NR** silt, and **NR** clay, pH **7.3**, and **8 % organic matter**, **35% - 40%** moisture and **NR** CEC. The concentrations are based on **dry** soil weight and are the result of **unmeasured** analysis of the chemical concentration in soil. (Reference 6015, Ma, 1982, Test Number 4082).

Effect of **Cadmium chloride** on ***Lumbricus rubellus*** Mortality

Endpoint on 2,4-Dichlorophenoxy Acetic Acid							
Measurement	Response Site	Observation Duration	Concentration / Dose				
			0.5 mg/k g soil ©)	20 mg/kg soil	150 mg/kg soil	1000 mg/kg soil	3000 mg/kg soil
ENDPOINT: 6 week(s) LC50 of mg/kg soil (NR: 150 - 1000) on Measurement: Mortality; Response Site: NR							
Mortality	Not Reported	6 week(s)	4 %	0n %	3n %	100* %	100* %
Mortality	Not Reported	6 week(s)	-	-	3n %	100* %	100* %

Mortality	Not Reported	12 week(s)	12 %	12 %	-	-	-
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* significant $p < 0.05$

n not significant, $p < 0.05$

A study of **17 day(s)** duration using **artificial soil** media was conducted in a **laboratory, indoor** site location with **NR** obtained ***Avena sativa*** (**Common oat**). The **seed** organisms (age: **0 day(s)**) and organism characteristics of: **NR**) were exposed for a duration of **17 day(s)** to a **dosed 1 time(s) per study period** application of **Cadmium chloride** in **NR** carrier or a(n) **NR** positive control through a(n) **direct application** exposure route. The reported chemical concentrations are the result of **unmeasured** analysis of chemical solutions and are based on the **CD** ion. The **artificial soil** was comprised of **90.5%** sand, **5.8%** silt, and **NR** clay, pH **5.1**, and **3.7 % organic matter**, **80** moisture and **NR** CEC. The concentrations are based on **dry** soil weight and are the result of **unmeasured** analysis of the chemical concentration in soil. (Reference 6169, Adema, 1989, Test Number 5160).

Effect of **Cadmium chloride** on ***Avena sativa*** Growth

Endpoint Data Only
ENDPOINT: 17 day(s) EC50/ of 305 mg/l (NR: NR) on Measurement: Biomass; Response Site: Aboveground portion
ENDPOINT: 17 day(s) NOEC of 10 mg/kg soil (NR: NR) on Measurement: Biomass; Response Site: Aboveground portion
ENDPOINT: 17 day(s) EC50 of 97 mg/kg soil (NR: NR) on Measurement: Biomass; Response Site: Aboveground portion

TERRESTRIAL DEFAULT OUTPUT FIELD IDENTIFIERS

Bold and underline is the field name.

A study of **STUDY DURATION MEAN (MIN-MAX) UNIT** duration using **EXPOSURE MEDIA** media was conducted in a **TEST LOCATION** site location with **ORGANISM SOURCE** (if NR appears in this field it should be out put) obtained **SCIENTIFIC NAME**. The **LIFESTAGE** organisms (age: **ORGANISM AGE AGE UNIT** and organism characteristics of: **ORGANISM COMMENT**) were exposed for a duration of **EXPOSURE DURATION MEAN (MIN-MAX) UNIT** to a **APPLICATION FREQUENCY** application of **CHEMICAL NAME** (CAS# **CAS NUMBER**) in **CARRIER CHEMICAL NAME** (CAS# **CAS NUMBER**) carrier or a **POSITIVE CONTROL CHEMICAL NAME** (CAS# **CAS NUMBER**) positive control through a(n) **EXPOSURE TYPE** exposure route. The reported chemical concentrations are the result of **METHOD** analysis of chemical solutions and are based on the **IONIC FRACTION** ion. The **EXPOSURE MEDIA** was comprised of **SOIL SAND MEAN (MIN-MAX)% sand**, **SOIL SILT MEAN (MIN-MAX)% silt**, and **SOIL CLAY MEAN (MIN-MAX)**, % clay, pH **PH MEAN (MIN-MAX)**, and **SOIL ORGANIC MATTER MEAN (MIN-MAX)ORGANIC MATTER UNITS ORGANIC MATTER TYPE**, **SOIL MOISTURE MEAN (MIN-MAX)% moisture** and **SOIL CEC MEAN (MIN-MAX) UNITS CEC**. The concentrations are based on **BASIS OF MEASUREMENT DRY-WET** soil weight and are the result of **SOIL CONCENTRATION MEASURED** analysis of the chemical concentration in soil. (Reference **REFERENCE #, AUTHOR, PUBLICATION YEAR, TEST NUMBER**, Documentation Code = **DOCUMENTATION CODE**).

Effect of **CHEMICAL NAME** (CAS# **CAS NUMBER**) on **SCIENTIFIC NAME EFFECT**

The **RESULT STATISTICAL METHOD FIELD** is inserted into the () of the min-max or +-value.

Effect Measurement	Response Site	Obs. Duration	EXPOSURE 1 Mean (Min - Max) OR (+-Value) & Unit (DOSE TYPE, if control)	EXPOSURE 2 Mean (Min-Max) OR (+-Value) & Unit	EXPOSURE 3 Mean (Min-Max) OR (+-Value) & Unit	EXPOSURE 4 Mean (Min-Max) OR (+-Value) & Unit	EXPOSURE 5 Mean (Min - Max) OR (+-Value) & Unit	EXPOSURE 6 Mean (Min -Max) OR (+-Value) & Unit	EXPOSURE 7 Mean (Min-Max) OR (+-Value) & Unit
ENDPOINT: Observation duration ENDPOINT of RESPONSE VALUE MEAN (MIN-MAX) UNIT on Measurement: EFFECT MEASUREMENT; Response Site: RESPONSE SITE									
Effect Measurement	Response Site	Obs. Duration Mean (Min-Max) OR (+-Value) & Unit	RESPONSE VALUE Mean (Min-Max) OR (+-Value) & Unit	RESPONSE VALUE Mean (Min-Max) OR (+-Value) & Unit	RESPONSE VALUE Mean (Min-Max) OR (+-Value) & Unit	RESPONSE VALUE Mean (Min-Max) OR (+-Value) & Unit	RESPONSE VALUE Mean (Min-Max) OR (+-Value) & Unit	RESPONSE VALUE Mean (Min-Max) OR (+-Value) & Unit	RESPONSE VALUE*(SIG NIF)Mean (Min-Max) OR (+-Value) & Unit

* = SIGNIFICANT LEVEL

n = NOT SIGNIFICANT LEVEL